Instructional Unit Title: Matter and Energy in an Ecosystem

Science High School – Environmental Science

The teacher may introduce energy and matter within environmental systems so that students can identify misconceptions and demonstrate their current understanding of the concepts. The teacher may provide various laboratory experiences (e.g., calorimetry lab, simulations, measurement of mass of a system) so that students can develop scientific explanations demonstrating the conservation of matter.

The teacher may provide various laboratory experiences (e.g., calorimetry lab, simulations, measurement of mass of a system) so that students can identify what energy is, how it is conserved, and how it is transformed. The teacher may engage students in a brainstorm and then provide materials so that students can model photosynthesis and cellular respiration processes demonstrating conservation of matter.

The teacher may provide local human impact case studies so that students can identify cascading disruption to ecosystem functionality. The teacher may provide opportunities for students to explore energy transfer through trophic levels so that students can identify organisms by trophic level, the relationship to energy transfer within multiple ecosystems, and calculate the energy efficiency within the system.

The teacher may provide field experiences so that students can identify ecosystem components and their relationship to ecosystem functionality. The teacher may model energy transfer via demonstrations so students can apply their understanding to analogous situations.

The teacher may group students (e.g., expert groups, jigsaw) to individually gather information and research disruptions within nutrient cycles so that students can describe the significance of nutrient cycling and synthesize their understanding of the individual components in order to communicate the importance of cycling for ecosystem functionality. **PERFORMANCE ASSESSMENT:** You are a consultant with an Environmental Firm asked to make a recommendation to a community stakeholder panel about land-use practices (cattle production versus chicken production versus corn production, etc.) in a least disruptive location. You must make a data-based argument for land-use with regards to transfer of energy within a local ecosystem which serves a community's food-production needs. You will argue a preferred location and food-production practice, reference efficiency of energy between trophic levels, and discuss potential consequences of your choice. You must determine what data will be needed, collected and analyzed, to provide evidence for your reasoning, and report your findings using text, graphs and data tables. You can present your findings in a mode of your choice (video, formal written report, Public Service Announcement, etc.)

This unit was authored by a team of Colorado educators. The unit is intended to support teachers, schools, and districts as they make their own local decisions around the best instructional plans and practices for all students. To see the entire instructional unit sample with possible learning experiences, resources, differentiation, and assessments visit <u>http://www.cde.state.co.us/standardsandinstruction/instructionalunitsamples</u>.